



YAHARA RIVER / LAKE MENDOTA WATERSHED (LR09)



Token Creek

This north central Dane County watershed, which extends into a small portion of southern Columbia County, is a mixture of urban, suburban, and agricultural land. Urban areas include DeForest, Windsor-Lake Windsor, and the north side of the city of Madison and a portion of the city of Sun Prairie. Principal streams are the Yahara River and Token Creek. Lake Mendota is the major lake in the watershed. Large portions of wetlands have been drained for agriculture or filled for development since European settlement. Cherokee Marsh is the last large wetland complex in the watershed. Smaller wetland complexes exist, as well as many “prior converted” wetland areas. In spring, numerous ephemeral ponds are extensively used by migratory waterfowl. Drainage tiles and ponds and intense (sub)urban and rural development threaten or have already destroyed many of these water features.

Lake Mendota is the largest waterbody in Dane County and the most heavily used in southern Wisconsin. The lake's recreational boaters spend an estimated \$3 million per year in the local economy, making this lake the fifth highest use waterbody in Wisconsin (including the Mississippi and Wisconsin Rivers).

This 85-square mile watershed has a medium susceptibility for groundwater contamination based on WDNR groundwater susceptibility mapping. Increased urban development on the west side of Sun Prairie and extending to Token Creek has raised concern about decreased groundwater recharge and altered base flow in Token Creek, a Class III trout stream.

Analysis conducted by the Dane County Regional Planning Commission (DCRPC) ranked this watershed as a high priority candidate for a nonpoint source priority watershed project. Thus, in 1996 a priority watershed appraisal was conducted.

Table 1. Municipalities in the Yahara R./Lake Mendota Watershed

Municipality	W/S#	County	1995 Population	2000 Population	Percent Growth 1995 - 2000
C. Madison	LR08 LR09 LR10	Dane	199,518	208,054	4.3
C. Sun Prairie	LR09 LR12	Dane	17,426	20,369	16.9
V. DeForest	LR09	Dane	5,976	7,368	23.3
T. Windsor	LR09	Dane	4,978	5,286	6.2
T. Burke	LR08, LR09	Dane	3,175	2,990	-5.8



Urban runoff from a parking lot.

This watershed includes rapidly urbanizing areas such as the City of Sun Prairie, and the Village of DeForest. A number of projects have been initiated through priority watershed program funds in the Lake Mendota watersheds (LR09 and LR10). The village of DeForest, along the Yahara River upstream of its confluence with Token Creek, is in the process of developing a comprehensive stormwater management plan. DeForest's overall stormwater management "master" plan accommodates and includes participation by the towns of Windsor and Vienna. The city of Sun Prairie is also in the process of developing a comprehensive stormwater management plan.



Yahara River sediment delivery into Lake Mendota

Yahara River The Yahara River originates in the marshy areas of Columbia County and flows as a small meandering creek through extensively farmed land to where it empties into the 2,000-plus acre Cherokee Marsh, and eventually Lake Mendota. Wetlands along this headwater stretch have been extensively drained, while small feeder streams have been straightened. The loss of wetlands combined with heavy agriculture in this reach have resulted in large sediment and nutrient loads and loss of valuable fish habitat. Heavy fertilizer use, poor animal waste management practices, and silage holding problems have reduced the river's water quality. A DCRPC report says the Yahara River carries the largest total mass of nutrients and sediments to Lake Mendota of the lake's five tributaries. Despite these loadings, the stream exhibits fair water quality and supports a good warm water sport fishery, as far upstream as DeForest. A monitoring station was reestablished on the Yahara River near Lake Windsor where flows were monitored from 1976 to 1980 and since 1989 and 1990 for monitoring for sediment, flow and phosphorus has continued. Development in DeForest and Windsor threatens water quality, in-stream habitat and fisheries of the Yahara River if adequate erosion control measures and post-development stormwater management are not established and maintained.

The Federal Emergency Management Agency (FEMA) is conducting floodplain studies in Dane County along Koshkonong Creek downstream of Sun Prairie and upstream of DeForest on the Yahara River. The possibility exists for similar work on Token Creek. Initial products include a digitized map of all floodplains in Dane County, to be incorporated into a Geographic Information System (GIS) database, and storm water quantity planning for a portion of Sun Prairie.



Token Creek

Token Creek This spring-fed Class III trout stream is the primary tributary to the Yahara River, providing significant base flow for the Yahara River and Lake Mendota (40 to 50 percent). The stream passes through residential (7 percent), agricultural (73 percent) and wetland areas (4 percent). Intense agricultural practices contribute sediment and nutrients to the stream and small impoundments in upstream areas warm the water, decreasing its suitability for trout management and contribute to excessive rooted aquatic plant production, periods of low dissolved oxygen and turbidity. The first two miles are a warm water sport fishery with some rough species (carp, freshwater drum). From mile marker 2 to 4, the stream is fed by springs and supports water cress and a diverse fishery of cold water, sport and forage fish.

A major dam on the creek once created a 44-acre millpond. In 1992 this dam partially failed and the millpond has become a shallow- to deep-water marsh. At least two significant springs and numerous seeps have been identified in the area formerly covered by the millpond. These springs are identified by two major tributaries rising to form clearly defined wetland/stream tracts that lead to the creek. Biologists believe that preserving the springs is essential for maintaining the existing brown trout fishery and



Brook trout, side view

establishing a brook trout fishery. The millpond, as previously maintained, absorbed the cold water springs, which heated the water and impacted the creek's fishery and water quality. WDNR recognized the potential of restoring the millpond area to a natural cold water stream corridor surrounded by good quality wetlands. In partnership with the town of Windsor, Dane County, local conservation groups and residents, WDNR purchased 69 acres of the Token Creek Millpond area for \$1 million. The Token Creek Millpond dam was removed and is being restored to a brook trout fishery. The stream is buffered by wetlands that have developed since the dam failed.

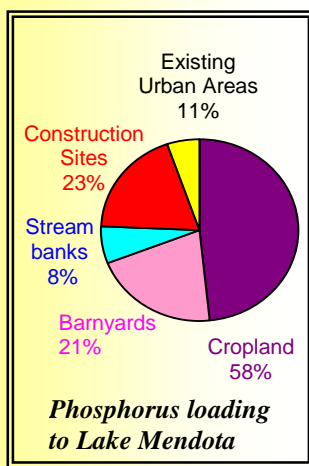
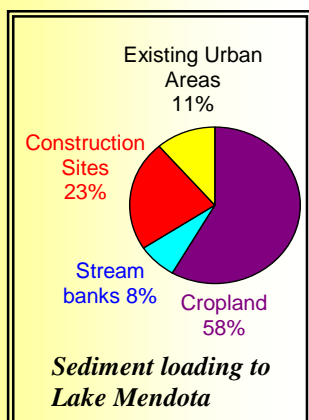
Runoff from the three major highways that cross the stream and the interchange and truck stops located adjacent to it likely affects water quality. Urban development in Sun Prairie and the towns of Windsor, Burke and Bristol will generate significant additional stormwater runoff bringing with it sediment and other pollutants. These problems need to be properly managed to protect the water quality and cold water fisheries of Token Creek, as well as the public and private investment made now and in the future to protect and enhance the stream and its fishery.

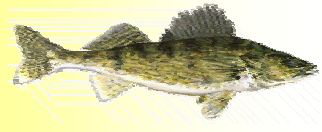
Unnamed Tributary This unnamed tributary to the Yahara River near Morrisonville in northern Dane County drains a predominately agricultural area. Some wetlands lie in the drainage area but others were drained. Intensive agriculture and polluted runoff have adversely affected the stream's habitat. A 1984 Hilsenhoff Biotic Index study indicates the stream has fair water quality despite polluted runoff (WDNR).

LAKES

Lake Mendota At 9,842 acres, Lake Mendota is the largest of the Yahara lakes and almost three times larger than Lake Monona, with only a slightly greater depth. Mendota's shoreline development factor (D_L), which assesses the degree of irregularity in the shoreline and hence the potential for biological diversity (Lathrop, 1992) and development, is 1.57, versus a D_L for Lake Kegonsa of 1.21 (1.0 is the value when a lake is a perfect circle). Thus, the lake's potential for diverse habitat in and near its bays and shallows is great. But the lake's wide littoral zone, combined with urban development in the immediate basin and agriculture throughout the watershed, has resulted in channels and embayments filling in and subsequent public requests for dredging for recreational motor craft access. Further, about 50 percent of original wetlands in the lake's watershed (which includes Six Mile and Pheasant Branch Creeks Watershed [LR10]) have been drained or filled (WDNR 1997).

Land use in the entire Lake Mendota watershed is comprised of 57.4 percent agriculture, 8.5 percent grassland/natural or wildlife areas, 1.4 percent woodlands, 20 percent developed, 5.7 percent wetland, and 6.9 percent open water. This mixture of agricultural, urban and other uses has changed from the agriculturally dominated watershed of the past (WDNR 1997). The lake's two watersheds (LR09 and LR10) include the urban areas of Middleton, Maple Bluff, Shorewood Hills, Waunakee, DeForest and large portions of Madison. Lathrop (1989b) observed that agricultural runoff is a much larger source of phosphorous to Lake Mendota than to the other Yahara Lakes because its drainage area is 4 to 5 times larger than the drainage area to the three other lakes. Lathrop (1992) also found, however, that although the total rural area is greater than the urban area in the Mendota watershed, the amount of phosphorus delivered per unit area of land is greater





Walleye photo and illustration

from urban land than from rural land. Soranno found that, in general, phosphorus from non-riparian rural areas is attenuated, while loads from urban areas, regardless of their location in the watershed, are not. Due to the rapid urbanization of land in the lake's watershed, a number of structural and nonstructural nutrient and sediment reduction and retention projects have been started. In Middleton and in Lottes Park, Madison, adjacent to Upper Mud Lake (LR08), nutrient retention ponds have been constructed. These best management practices are anticipated to reduce the lake's current inputs of nutrients and sediment. In 1990 and 1991, more than 310,000 gallons of untreated wastewater from Stokely's cannery operations in the village of Waunakee contributed excessively high nutrient, solids and BOD₅ loads to Six Mile Creek, a direct tributary to Lake Mendota. The lake received these pollutants and the enhanced loads from the ensuing fish kills in the creek.

Despite these problems, in-lake recreation on Mendota is high and includes use of its warm water fishery (e.g., walleye, perch, panfish, bass, northern pike, and muskellunge), sailing, boating, jet skiing, sail boarding, and swimming. Use of Mendota and adjacent wetlands for aesthetic, shoreline and research activities is also popular. The waterbody is one of the most extensively-researched lakes in the United States. Water quality has improved in Lake Mendota during the last 25 years with reduced phosphorous loads resulting in improved water clarity. This, in part, has led to an increase in aquatic plant growth, particularly Eurasian water milfoil. Mechanical harvesting projects have been implemented yearly to remove this aquatic nuisance species.



During the 25-year-period of water quality improvement there were a number of years with lower than average spring runoff. Increased runoff from high water years (1993, 1996) and continued urban growth may have increased annual phosphorous loads, causing water quality to decline. One study has found, however, an inverse relationship between the heterogeneity of the lake's riparian buffers to the incidence of blue-green algae blooms (Soranno). Mendota still experiences occasional blue-green algae blooms and excessive weed growth. Algae blooms are not, however, a recent phenomena in the Madison lakes; algae blooms were reported as early as 1888 on Lakes Mendota and Monona. A major blue-green algae bloom occurred in the spring of 1990, causing dissolved oxygen to drop to 1 mg/l in at least one portion of the lake. The dissolved oxygen standard for a warm water sport fishery lake is 5 mg/l. Late winter melt and stormwater runoff carrying large amounts of nutrients into the lake--climatic conditions that enhance internal cycling of sediment entrained phosphorus--and trophic conditions conducive to algal growth factored into the 1990 bloom.



Five major streams and two storm sewers contribute phosphorus, sediment and other constituents to the lake. In-lake chloride and sodium concentrations have risen over the last 30 years, though in Mendota are at levels below the other Yahara Lakes. Most of the lake's water quality problems can be linked to past and present rural and urban runoff carrying sediments, nutrients and, possibly, toxicants into the lake.

Lake Mendota is a priority watershed project with ongoing implementation work. Substantial financial resources have contributed to a greater understanding of pollutant sources, sinks and remediation and prevention strategies. A major focus of the Lake Mendota Priority Watershed Project is on sediment and phosphorus reductions from agricultural and urban sources, stormwater management, groundwater and wetland protection, and public education. The 1997 Priority Watershed Plan (in publication) has

an excellent summary of wetlands in the basin. Interested readers are encouraged to obtain both this draft plan as well as the 1997 Lake Mendota Priority Watershed Appraisal Report. This watershed has also been chosen as a U.S. Natural Resources Conservation Service's EQIP project. This will provide additional financial resources for the installation of agricultural best management practices.



Canada goose

Goose Lake (Pond) is a 73-acre internally drained wetland/lake complex with a mean depth of three feet. Historically, the lake received effluent from the Arlington wastewater treatment plant and canning wastewater from Del Monte. These inputs plus agricultural runoff affect the lake's quality. The Madison Audubon Society (MAS) owns 174 acres adjacent to the pond, 19 of which were agricultural acres that have been converted back to wetland with a system of berms. MAS has also developed the Tall Grass Prairie Restoration Project near the pond, which contributes to the area's habitat diversity. Numerous waterfowl use this shallow lake and wetland complex, including Tundra Swan, Canvasback, Canadian Geese, and even, on 1995, White Pelican (WDNR 1996). Audubon and other organizations are leading watershed improvement projects including an 80-acre tall grass prairie restoration, a 19-acre wetland restoration and a 4.5-acre wetland restoration (Sorge).

Resources of Concern (LR09)



Banded killifish

WDNR's Heritage Resources Database indicates that the following water-dependent endangered, threatened or special concern species and/or communities have been sighted in this watershed within the last 20 years.

Table 2. Endangered, Threatened or Species of Special Concern

Species Common Name	Latin Name	Habitat
Banded Killifish	<i>Fundulus Diaphanus</i>	Lake Mendota
Lake Sturgeon	<i>Acipenser Fulvescens</i>	Lake Mendota
Lake Herring	<i>Coregonus Artedi</i>	Lake Mendota



Lake herring



Lake sturgeon

Table 3. Endangered, Threatened or Plant Communities of Special Concern

Plant Community	Location	Indicator Species/Description
Northern Wet Forest, Southern Sedge Meadow, Shrub-Carr	Cherokee Marsh	Cherokee Marsh is a part of a 2,000-acre wetland complex lying east of the Yahara River. Most of the marsh has fen-like qualities although it contains species of low prairie, shrub-carr, bog and sedge meadows. Partial ditching has occurred. This site is designated a public use natural area and includes a variety of wetland communities ranging from forested areas of tamarack to open sedge meadow.
Wet Prairie	Yahara Wet Prairie	This prairie is located within the Cherokee Marsh wetland complex. Brushing and burning are needed to maintain the open prairie and the rare species that occur here.
Dry-Mesic Prairie	Westport Drumlin Prairie	This small remnant of the Empire Prairie occupies a ridge mantled with glacial till. More than 100 prairie species have been recorded here. Four acres within the tract are considered dry prairie.
Calcareous Fen	Wheeler Road Fen	A small but rich calcareous fen between the uplands to the east and the Yahara River to the west. Typical fen plants occur here.



Cherokee Marsh boardwalk

RECOMMENDATIONS

Dane County Regional Planning Commission has developed a set of specific nonpoint recommendations for communities in Dane County. This list should be considered by communities when planning water quality work and budget items.

1. The Lower Rock River Basin Team should make available nonpoint source funds, stewardship funds or Lake Protection Program grants to acquire wetlands, ephemeral ponds, and farmed and prior-converted wetlands to groups and communities in the DeForest and Arlington areas of the Yahara-Mendota Watershed.¹
2. The Lower Rock River Basin Team should work with Dane County to develop an aquatic plant management plan for Lake Mendota similar to efforts done on Lakes Waubesa and Monona.¹
3. The Lower Rock River Basin Team, Dane County, the Cities of Madison and Middleton, and the Villages of Maple Bluff and Shorewood Hills should consider planting rooted aquatic plants to speed up recolonization of native aquatic plants in Lake Mendota.^{1,2}
4. The Cities of Madison, Sun Prairie and Middleton and the Village of DeForest should upgrade their existing erosion control ordinances to be consistent with the technical provisions of the Dane County ordinance Chapter 14.²
5. The City of Middleton should conduct comprehensive stormwater management planning.²
6. Communities in the watershed should take advantage of Urban Riverway and other Stewardship Fund sources to acquire public lands along streams and lakes.²



Yellow perch



Wild iris close-up



Muskellunge

7. The Lower Rock River Basin Team, City of Sun Prairie and Dane County should develop a comprehensive plan to protect Token Creek Springs. This effort should address stormwater flows and identify, and recommend means to protect groundwater recharge areas that feed the springs.^{1,2}
8. The City of Middleton should develop a comprehensive stormwater management plan.²
9. Dane County, the Cities of Madison, Middleton, and Sun Prairie and the Villages of DeForest and Waunakee should take advantage of federal, state and private funding opportunities to acquire additional public access and lands on Lake Mendota, Pheasant Branch Creek and wetlands, Sixmile Creek and wetlands, Token Creek and the Yahara River.²

1. These recommendations are a basis for work planning or other decisions, which must be approved by the appropriate DNR division administrator (the recommendations are a starting point for the work planning process).

2. These recommendations are advisory to the public, local governments, lake management organizations, and other groups or agencies. These recommendations are not binding. No statutory or codified requirements exist

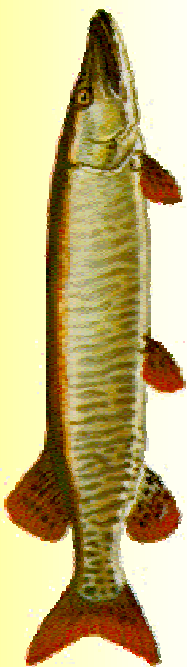
ACKNOWLEDGMENTS

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Muskellunge



Northern pike

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Stream Table References

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Northern pike

Table 4. Streams in the Yahara-Mendota Watershed (LR09)

Stream Name	WBIC	County	Length (Miles)	Existing Use (Miles)	Potential Use (Miles)	Supporting Potential Use (Miles)	Current Codified Use	303(d) Status	Use Impairment		Data Assessment	Data Level	Trend	References
									Source	Impact				
Token Creek	0806600	Dane	0 - 2	WWSF/2	COLD III/2	Not	WWSF*	N	HM, NPS, CE, URB	FLOW, HAB, MIG, TURB, SED, TEMP	M	B4 H4 C4 T2	I	10, 12, 17, 23, 56, 62, 63, 66, 78, 83
			2 - 4	COLD III/2	COLD II/2	Part	COLD II	Y						
			4 - 10	COLD III/6	COLD II/6	NOT	WWSF*	Y (mile 4 - 6.5)						
Yahara River	0807300	Dane	20	WWSF/20	same	Part	WWSF*	N	HM, CL, SB, BY, CE, URB, DEV	FLOW, HAB, TURB, SED, NUT, DO, TEMP	M	B4 H4 C3	S	10, 12, 23, 56, 63, 77, 83
1 Unnamed Streams			19											

Table 5. Lakes in the Yahara-Mendota Watershed (LR09)

Lake Name	County	Town, Range, Section	WBIC	Surface Area (Acres)	Max Depth (ft)	Mean Depth (ft)	Lake Type	Winter kill	Access	SH	Hg	Mac	LMO	TSI	TSI Class	Lake Plan Prot	P Sens	Impairment		Comments
																		Source	Impact	
Cherokee Lake	Dane	T08NR09E S24	0806500	57	20	9	DG	N	--	--	GA	--	--	--	EU	PROT	I B	CL, CE, SB, URB, NPS	SED, DO, NUT, MAC	DNR purchased land
Cherokee Marsh	Dane	T09NR09E S23	0806200	379	23	3	DG	--	T	--	GA	--	--	--	--	PROT	--	CL, CE, SB, URB, NPS	HAB, SED, DO, NUT, MAC	--
Goose Lake	Columbia	T10NR09E S25	0776000	73	3	--	SE	Y	R	R	GA	--	--	--	--	--	II Ins	NPS, CL	SED, NUT, HAB, DO	Wetlands; owned by Goose Pond Sanctuary, Inc., & Manthe; DelMonte Spreading site directly N.
Lake Mendota	Dane	T07NR09E S12	0805400	9,842	82	42	DG	N	BR	--	GA	EM	X	52***	--	PROT PLAN	I B	URB, CL, NPS	NUT, MAC, ALG, SED	--
Lake Windsor	Dane	T09NR10E S31	0807400	9	6	--	DG	Y	T	C	GA	--	Y	67*	EU	PLAN	II B	CL, NPS, CE	SED, NUT, TURB, ALG, DO	--

